AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Original) A vehicle dynamics behavior reproduction system for adapting cornering stiffness to driving situation of a motor vehicle in order to describe accurately behavior of the motor vehicle on the basis of various information derived from outputs of on-vehicle sensors without being influenced by said driving situation of the motor vehicle, comprising:

vertical wheel force arithmetic means for arithmetically determining a load applied to each of wheels of said motor vehicle as a vertical wheel force;

lateral wheel force arithmetic means for arithmetically determining a lateral wheel force acting on each of said wheels;

cornering stiffness adaptation means for effectuating adaptation of the cornering stiffness at each of said wheels to said driving situation;

a state space model/observer unit for determining solutions of simultaneous differential equations relating to a dynamics theory of the motor vehicle for calculating variables involved in said dynamics theory;

a selector for selecting a specific signal as required from signals representing said solutions generated by said state space model/observer unit;

delay means for delaying said specific signal on a predetermined unitary time basis; and

tire side slip angle arithmetic means for arithmetically determining a tire side slip angle at each of said wheels in view of said driving situation,

wherein said state space model/observer unit includes a state space observer designed for determining variables which can not straightforwardly be measured.

2. (Original) A vehicle dynamics behavior reproduction system according to claim 1, wherein said lateral wheel force arithmetic means is designed to approximate the lateral force F_Y at each of said wheels in accordance with

$$F_{Yij} = \left[k_1 - \frac{F_{Zij}}{k_2} \right] \cdot F_{Zij} \cdot \arctan (k_3 \cdot \alpha_{ij}) \qquad (1)$$

where F_Z represents said vertical wheel force,

α represents said tire side slip angle, and

k_1, k_2 and k_3 represent constant parameters specific to the tire.

3. (Original) A vehicle dynamics behavior reproduction system according to claim 1, wherein said cornering stiffness adaptation means is designed to effectuate adaptation of the cornering stiffnesses of the individual wheels, respectively, to the driving situation on a predetermined unitary time basis in accordance with an undermentioned adaptation equation:

$$c_{ij}(t_k) = \frac{F_{Yij}(t_k)}{\alpha_{ij}(t_k)},\ if\ \alpha_{ij}(t_k) \neq 0 \qquad (2)$$
$$c_{ij}(t_k) = const.,\ if\ \alpha_{ij}(t_k) = 0$$

where c(t) represents the adapted cornering stiffnesses at the wheels, respectively, at a time point t,

$F_Y(t)$ represents the lateral forces of the wheels, respectively, at the time point t,

α (t) represents the side slip angles of the tires, respectively, at the time point t, and where

const. represents a constant used to describe the cornering stiffness in linear vehicle model theory.

4. (New) A vehicle dynamics behavior reproduction system according to claim 1, wherein:

the state space model/observer unit comprises a state space model including the differential equations relating to the dynamics theory of the motor vehicle; and

the state space model/observer unit adjusts the parameters of the state space model so that a difference between a calculated yaw rate value and a detected yaw rate sensor value becomes zero.

5. (New) A vehicle dynamics behavior reproduction system according to claim 1, wherein:

the state space model/observer unit comprises a state space model including the differential equations relating to the dynamics theory of the motor vehicle;

the state space model determines the solutions of the differential equations relating to the dynamics theory of the motor vehicle as state space vectors; and

the state space vectors comprise values for vehicle speed, vehicle body side slip angle and a calculated yaw rate value.

6. (New) A vehicle dynamics behavior reproduction system according to claim 1, wherein the specific signal is a vehicle body side slip angle.

7. (New) A vehicle dynamics behavior reproduction system according to claim 1, wherein the variables which can not straightforwardly be measured include a vehicle body side slip angle.

8. (New) A vehicle dynamics behavior reproduction system according to claim 7, wherein the specific signal is also the vehicle body side slip angle.

9. (New) A vehicle dynamics behavior reproduction system for adapting cornering stiffness to driving situation of a motor vehicle in order to describe accurately behavior of the motor vehicle on the basis of various information derived from outputs of on-vehicle sensors without being influenced by said driving situation of the motor vehicle, comprising:

a vertical wheel force arithmetic module that arithmetically determines a load applied to each of wheels of said motor vehicle as a vertical wheel force;

a lateral wheel force arithmetic module that arithmetically determines a lateral wheel force acting on each of said wheels;

a cornering stiffness adaptation module that effectuates adaptation of the cornering stiffness at each of said wheels to said driving situation;

a state space model/observer module that determines solutions of simultaneous differential equations relating to a dynamics theory of the motor vehicle for calculating variables involved in said dynamics theory;

a selector module that selects a specific signal as required from signals representing said solutions generated by said state space model/observer module;

a delay module that delays said specific signal on a predetermined unitary time basis; and

a tire side slip angle arithmetic module that arithmetically determines a tire side slip angle at each of said wheels in view of said driving situation,

wherein said state space model/observer module includes a state space observer designed for determining variables which can not straightforwardly be measured.

10. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein said lateral wheel force arithmetic module is designed to approximate the lateral force F_Y at each of said wheels in accordance with

$$F_{Yij} = \left[k_1 - \frac{F_{Zij}}{k_2} \right] \cdot F_{Zij} \cdot \arctan (k_3 \cdot \alpha_{ij}) \qquad (1)$$

where F_Z represents said vertical wheel force,

α represents said tire side slip angle, and

k_1, k_2 and k_3 represent constant parameters specific to the tire.

11. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein said cornering stiffness adaptation module is designed to effectuate adaptation of the cornering stiffnesses of the individual wheels, respectively, to the driving situation on a predetermined unitary time basis in accordance with an undermentioned adaptation equation:

$$c_{ij}(t_k) = \frac{F_{Yij}(t_k)}{\alpha_{ij}(t_k)}, \ if \ \alpha_{ij}(t_k) \neq 0$$
$$c_{ij}(t_k) = const., \ if \ \alpha_{ij}(t_k) = 0 \qquad (2)$$

where c(t) represents the adapted cornering stiffnesses at the wheels, respectively, at a time point t,

$F_Y(t)$ represents the lateral forces of the wheels, respectively, at the time point t,

α (t) represents the side slip angles of the tires, respectively, at the time point t, and where

const. represents a constant used to describe the cornering stiffness in linear vehicle model theory.

12. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein:

the state space model/observer module comprises a state space model including the differential equations relating to the dynamics theory of the motor vehicle; and

the state space model/observer module adjusts the parameters of the state space model so that a difference between a calculated yaw rate value and a detected yaw rate sensor value becomes zero.

13. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein:

the state space model/observer module comprises a state space model including the differential equations relating to the dynamics theory of the motor vehicle;

the state space model determines the solutions of the differential equations relating to the dynamics theory of the motor vehicle as state space vectors; and

the state space vectors comprise values for vehicle speed, vehicle body side slip angle and a calculated yaw rate value.

14. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein the specific signal is a vehicle body side slip angle.

15. (New) A vehicle dynamics behavior reproduction system according to claim 9, wherein the variables which can not straightforwardly be measured include a vehicle body side slip angle.

16. (New) A vehicle dynamics behavior reproduction system according to claim 15, wherein the specific signal is also the vehicle body side slip angle.